

Appl. No. 10/607,737  
Response to Office Action of 21 April 2006  
Amendment Dated 21 July 2006

### **Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

### **Listing of Claims:**

1. (Currently Amended) A protection relay for a power line system ~~were~~ where current on a bus is provided to one or more power lines for receiving and generating power, and where associated with each of said power lines is a current transformer for providing a line signal ~~current~~ representative of current flowing through a respective power line, and wherein said protection relay is operative for generating a fault trip signal in response to a detected power ~~signal~~ line fault, the protection relay comprising:

a signal processor responsive to ~~signal~~ said line signals ~~currents~~ for generating a fault trip signal in response to a detected fault on any one of the power lines;

means for summing said ~~signal~~ line signals ~~current~~, separately for each power line phase, for all power lines coupled to said bus and producing,

a first signal indicative of the phasor sum of all ~~signal~~ line signals ~~currents~~, and

a second signal representative of the magnitude sum of ~~signal-line~~ ~~currents~~ said line signals ;

Appl. No. 10/607,737  
Response to Office Action of 21 April 2006  
Amendment Dated 21 July 2006

means for deriving,

a first time derivative signal representative of the first derivative of  
said first signal, and

a first second time derivative signal representative of the first  
derivative of said second signal;

means for deriving,

a first harmonic signal representative of the a selected harmonic of  
said first time derivative signal, and

a second harmonic signal representative of the a selected  
harmonic of said second time derivative signal;

means for determining the harmonic phase difference between said first  
and second harmonic signals;

phase comparator means responsive to said harmonic phase difference  
for selectively generating a blocking signal for blocking said fault  
trip signal if said harmonic phase difference satisfies a first  
condition; and

a trip signal generator means responsive to said first and second signals  
for generating a fault trip signal upon said first and second signals  
being beyond a defined bus differential characteristic conditioned  
upon the status of said blocking signal.

Appl. No. 10/607,737  
Response to Office Action of 21 April 2006  
Amendment Dated 21 July 2006

2. (Currently Amended) A protection relay for a power line system were where current on a bus is provided to one or more power lines for receiving and generating power, and where associated with each of said power lines is a current transformer for providing a line signal ~~current~~-representative of current flowing through a respective line, and wherein said protection relay is operative for generating a trip signal in response to a detected power signal line fault, the protection relay comprising:

signal processor responsive to ~~signal line currents~~ said line signals for generating a trip signal in response to a detected fault on any one of the power lines;

means responsive to said ~~signal line currents~~ line signals for detecting current transformer saturation; and

means for selectively generating a blocking signal for blocking said trip signal in response to detection of current saturation of said current transformer.

Appl. No. 10/607,737  
Response to Office Action of 21 April 2006  
Amendment Dated 21 July 2006

3. (New) A protection relay for a power line system where current on a bus is provided to one or more power lines for receiving and generating power, and where associated with each of said power lines is a current transformer for providing a line signal representative of current flowing through a respective line, and wherein said protection relay is operative for generating a fault trip signal in response to a detected power signal line fault, the protection relay comprising:

a first signal processing means responsive to said line signals for generating a fault trip signal in response to a detected fault on any one of the power lines enabled upon the absence of a blocking signal; and

a second signal processing means responsive to said line signals for,

(i) detecting current transformer saturation; and

(ii) for selectively generating said blocking signal for blocking said fault trip signal in response to detection of saturation of said current transformer occurring for less than a selected maximum block time.

4. (New) The protection relay of claim 3 wherein said blocking signal is a function of (i) the first time derivative of the phasor sum of said line currents, and (ii) the first time derivative of the magnitude sum of said line currents.

5. (New) A method for providing fault protection for power line systems where current on a bus is provided to one or more power lines for receiving and generating power, and where associated with each of said power lines is a

Appl. No. 10/607,737  
Response to Office Action of 21 April 2006  
Amendment Dated 21 July 2006

current transformer for providing a line signal representative of current flowing through a respective line, and wherein said protection relay is operative for generating a fault trip signal in response to a detected power signal line fault, the method comprising the steps of:

generating a fault trip signal in response to a detected fault on any one of the power lines conditioned upon the absence of a blocking signal;  
detecting saturation in response to said transformer line signal associated with any current transformer associated with any of said power lines; and  
selectively generating said blocking signal for blocking said fault trip signal in response to detection of said saturation of said current transformer occurring for less than a selected maximum block time.

6. (New) The apparatus of claim 5 further including the steps of:

- (i) determining a first time derivative of the phasor sum of said line currents , and
- (ii) determining the first time derivative if the magnitude sum of said line currents.

Appl. No. 10/607,737  
Response to Office Action of 21 April 2006  
Amendment Dated 21 July 2006

7. (New) A protection relay for a power line system where current on a bus is provided to one or more power lines for receiving and generating power, and where associated with each of said power lines is a current transformer for providing a line signal representative of current flowing through a respective power line, and wherein said protection relay is operative for generating a fault trip signal in response to a detected power line fault, the protection relay comprising:

- a signal processor responsive to said line signals for detecting a fault associated with any one power line and generating a fault trip signal in response thereto;

- means for summing said line signals, separately for each power line phase, for all power lines coupled to said bus and producing, a first signal indicative of the phasor sum of all line signals, and a second signal representative of the magnitude sum of said line signals;

- signal processing means for deriving,

- a first time derivative signal representative of the first derivative of said first signal, and

- a second time derivative signal representative of the first derivative of said second signal;

- means for deriving,

- a first harmonic signal representative of the a selected harmonic of said first time derivative signal, and

Appl. No. 10/607,737  
Response to Office Action of 21 April 2006  
Amendment Dated 21 July 2006

a second harmonic signal representative of the a selected  
harmonic of said second time derivative signal;  
means for determining the harmonic phase difference between said first  
and second harmonic signals;  
a signal phase comparator responsive to said harmonic phase difference  
for selectively generating, a blocking signal for blocking said fault  
trip signal if said harmonic phase difference satisfies a first  
condition; and  
a trip signal generator responsive to said first and second signals for  
generating a fault trip signal upon said first and second signals  
being beyond a defined bus differential characteristic conditioned  
upon the status of said blocking signal.